

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
16 October 2003 (16.10.2003)

PCT

(10) International Publication Number
WO 03/085809 A1

(51) International Patent Classification⁷: **H02K 33/02,**
B06B 1/04, G08B 6/00

(21) International Application Number: **PCT/JP03/04200**

(22) International Filing Date: **2 April 2003 (02.04.2003)**

(25) Filing Language: **English**

(26) Publication Language: **English**

(30) Priority Data:
2002-102352 4 April 2002 (04.04.2002) JP

(71) Applicant (for all designated States except US): **MAT-**
SUSHITA ELECTRIC INDUSTRIAL CO., LTD.
[JP/JP]; 1006, Oaza Kadoma, Kadoma-shi, Osaka
571-8501 (JP).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **YAMASAKI,**

Hirokazu [JP/JP]; 4-10-13-305, Hoshida, Katano-shi,
Osaka 576-0016 (JP). **KAMEDA, Koji** [JP/JP]; 6-Higashi
2-1207, Sotojima-cho, Moriguchi-shi, Osaka 570-0096
(JP).

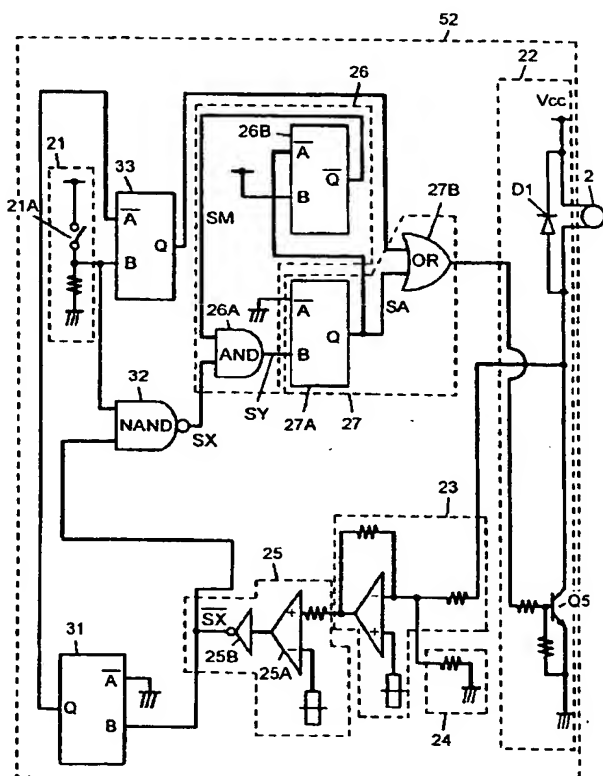
(74) Agents: **IWAHASHI, Fumio** et al.; c/o Matsushita Elec-
tric Industrial Co., Ltd., 1006, Oaza Kadoma, Kadoma-shi,
Osaka 571-8501 (JP).

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU,
AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,
CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH,
GM, HR, HU, ID, IL, IN, IS, KE, KG, KP, KR, KZ, LC,
LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW,
MX, MZ, NI, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD,
SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US,
UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (*regional*): ARIPO patent (GH, GM,
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),
Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),
European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,

[Continued on next page]

(54) Title: **VIBRATION LINEAR ACTUATING DEVICE, METHOD OF DRIVING THE SAME DEVICE, AND PORTABLE INFORMATION APPARATUS USING THE SAME DEVICE**



(57) Abstract: A vibration linear actuating device includes a vibrating linear actuator and a driver (52) for driving actuator. Actuator includes mover having permanent magnet magnetized in a radial direction, stator having coil (2) and facing the permanent magnet, and elastic body for coupling stator to mover. The driver includes driving section having switching element (Q5) for powering coil (2), output controller (27) for controlling switching element (Q5), zero-cross detector (25) for detecting a zero-cross point of back electromotive force generated in coil (2) and having an output to be fed back to the output controller (27). In this structure, the driver powers coil (2) in one way to keep mover vibrating in corporation with elastic body.

WO 03/085809 A1

BEST AVAILABLE COPY